# First record of House Crow *Corvus splendens* for Madagascar—potential impacts and suggested management of an invasive bird species

*Theo E. W. Linders and Olivier Langrand*

**Première mention du Corbeau familier *Corvus splendens* à Madagascar—impacts potentiels et proposition de gestion de cette espèce envahissante.** Une population de 15 Corbeaux familiers *Corvus splendens* a été découverte début 2014 dans la ville côtière de Toamasina à Madagascar. Compte tenu du caractère invasif de cette espèce originaire de l'Asie du sud et de son impact négatif potentiel sur l'avifaune locale et en particulier sur les espèces endémiques de Madagascar, un examen des options de gestion de cette espèce est présenté pour inciter les autorités compétentes à éradiquer le Corbeau familier tant que sa population est encore réduite.

**Summary.** A population of 15 House Crows *Corvus splendens* was discovered in the coastal city Toamasina, Madagascar, at the start of 2014. Because of the invasive character of this southern Asian species and the potential negative impacts on the local avifauna, especially species endemic to Madagascar, a review of management options is provided to prompt the authorities to eradicate the House Crow while its population is still small.

House Crow *Corvus splendens*, which is native to Iran, Pakistan, India, Sri Lanka and Myanmar (Madge 2009), is listed as a species of Least Concern (BirdLife International 2014). It has extended its range throughout the Indian Ocean and beyond via deliberate introductions and ship-assisted colonisation. House Crows are now or have been established along most of Africa's east coast (from Kenya to South Africa), in the Middle East (Israel, Jordan, Saudi Arabia, Yemen), on some western Indian Ocean islands (Mauritius, Seychelles), in South-East Asia (Hong Kong, Indonesia, Malaysia, Singapore) and even in Australia, Europe (Netherlands) and North America (USA: Florida) (Ryall 2002, Ottens & Ryall 2003, Pranty 2004, Mwinyi & Said 2009, Island Conservation 2012a). The species is strictly commensal and no populations are known to live independently of humans, even within its native range (Nyari *et al.* 2006). They have negative impacts on people through crop raiding (Mwinyi & Said 2009), excessive noise at roost sites (Yap & Sodhi 2004) and spreading of pathogens (Peh & Sodhi 2002).

House Crow is considered to be one of the world's most invasive bird species (GISD 2010) and has negative impacts on biodiversity including competition with native species (Yap & Sodhi 2004), predation and harassment of native birds (Ryall 1992). Control and eradication programmes have been undertaken in parts of their non-native range (Island Conservation 2012b), e.g. in Tanzania (Mwinyi & Said 2009), the Netherlands (Ottens & Ryall 2003; A. den Hartog pers. comm.), Mauritius (Feare

**Figure 1.** House Crow *Corvus splendens*, Toamasina, Madagascar, 2 January 2014 (Theo Linders). At least 15 were present the day the photograph was taken.

Corbeau familier *Corvus splendens*, Toamasina, Madagascar, 2 janvier 2014 (Theo Linders). Au moins 15 individus étaient présents à cette date.

& Mungroo 1990; V. Tatayah pers. comm.), Singapore (Yap & Sodhi 2004), Australia (Nyari *et al.* 2006), Jordan (S. Jbour pers. comm.) and on Socotra, Yemen (Suleiman & Taleb 2010, Suleiman *et al.* 2011, Island Conservation 2012b). Methods used include poisoning with avicides, trapping and shooting (Feare & Mungroo 1990, Mwinyi & Said 2009, Suleiman & Taleb 2010, Suleiman *et al.* 2011)

### Status in the Malagasy region

In the Malagasy region, House Crow is established in Mauritius and is sporadically recorded in Seychelles and on Réunion (Safford 2013, Sinclair & Langrand 2013). In Seychelles it became self-established on Mahé in the 1970s but was eradicated in 1994; since then singles have continued to arrive occasionally but have been shot by government authorities as soon as detected, where possible, and no permanent population has resulted (Skerrett & Bullock 2001, Ryall 2002, 2010; A. Skerrett pers. comm. *per* R. Safford). On Mauritius the species was first reported in 1900 (Cheke & Hume 2008) and is now widespread around settlements (Feare & Mungroo 1990). Control of the population has been taking place over the past ten years, but despite these efforts the population on Mauritius is increasing because of the availability of waste (V. Tatayah pers. comm.). On Réunion, sporadic appearances by a few individuals were reported in 2004 (Cheke 2008), 2006 (Safford 2013) and in 2010 and 2011 (SEOR 2010–11), but the birds have been subsequently destroyed (F.-X. Couzi pers. comm.). On Rodrigues two observed in 1995 were shot (Safford 2013). There are now no House Crows there (V. Tatayah pers. comm.) and the species has not been reported from the Comoros or Madagascar (Safford 2013, Sinclair & Langrand 2013).

### First report of House Crow in Madagascar

Madagascar is one of the world's biodiversity hotspots (Mittermeier *et al.* 1999, 2004). Although the island supports relatively few breeding bird species compared to other large tropical islands, it is of exceptional ornithological importance, as more than half of the 220 breeding species are endemic to Madagascar (Sinclair & Langrand 2013). Fortunately, Madagascar has few introduced bird species, all of which are inked to human settlements and degraded natural ecosystems. These include Common Myna *Acridotheres tristis*, which has reached invasive proportions, and House Sparrow *Passer domesticus* (Sinclair & Langrand 2013).

The newest non-native bird species recorded on Madagascar is the House Crow. The first sighting was made on 1 January 2014, when two were observed by TL in Toamasina (Tamatave; 18°10'S 49°22'E) on the east coast. Further observations revealed the presence of at least 15 individuals, in a relatively small area. The birds roosted in trees on a private plot, bordered by the Rue de la Batterie and Rue Grandidier (18°15'S 49°41'E). The site is within 50 m of the beach and near the industrial harbour of Toamasina, the largest in Madagascar, which is unsurprising as the birds' arrival was almost certainly ship-assisted and they prefer roost sites near the sea (C. Ryall pers. comm.). The origin of the birds is unknown, but Mauritius and the East African coast are the nearest potential areas and have many commercial exchanges with Madagascar.

### Potential impacts on the Malagasy native avifauna

Most endemic Malagasy birds are forest species and most occur only in primary forests and adjacent second growth (Langrand 1990). House Crows, on the other hand, are dependent on human settlements and therefore their negative impact on the Malagasy native avifauna will probably be limited. They are, however, crop pests elsewhere, and are known to attack small birds and take their eggs, compete with native species and destroy their nests and eggs (Yap & Sodhi 2004). In Toamasina, the commonest bird species are the invasive Common Myna and House Sparrow, and Rock (feral) Dove *Columba livia*. Native bird species, including most of the endemics, are scarcer, but include Cattle Egret *Bubulcus ibis*, Madagascar Kestrel *Falco newtoni*, African Palm Swift *Cypsiurus parvus gracilis*, Pied Crow *Corvus albus*, Madagascar Wagtail *Motacilla flaviventris*, Madagascar Crested Drongo *Dircurus forficatus*, Madagascar White-eye *Zosterops maderaspatana*, Souimanga Sunbird *Cinnyris souimanga*, Madagascar Green Sunbird *C. notatus* and Madagascar Red Fody *Foudia madagascariensis*. Observations from East Africa indicate that House Crows can have a significant

negative impact on weavers and sunbirds (Ryall 1992, Mwinyi & Said 2009).

The risk of displacement of native bird species by House Crows in Toamasina exists through direct predation, competition for nest sites and food resources. In addition, this population could expand within Madagascar and to nearby islands.

## Proposed management action

Considering the above-mentioned risks, we suggest that the authority responsible for biodiversity conservation in Madagascar considers eradicating all House Crows currently present in Toamasina. Eradication is still possible considering the small population and small home range.

Several methods could be used: netting, trapping or shooting. Considering that the crows are in a heavily populated urban environment, we would suggest using trapping or netting. Chemical products used to kill or stun the birds could also be employed provided that the baiting is performed in a fully controlled environment, as dead and dying birds can threaten public health especially children, poultry and household pets (Yap & Sodhi 2004, Mwinyi & Said 2009). One option would be to use DRC-1339, an avicide metabolised almost entirely by the time of death, thereby minimising secondary risks as corvids are highly susceptible to this product, which reduces the risk to non-target species. Carcasses could be collected from below their roost sites. Pre-baiting using non-toxic eggs could be used to assess non-target risks and ensure crows feed at particular sites on that food source (Coates *et al.* 2007). Shooting with appropriate firearms and ammunition from a camouflaged position has been used successfully (Suleiman *et al.* 2011).

The 2014 House Crow eradication project in Hoek van Holland, Netherlands, could be used as an example, as it dealt with a relatively small population of *c.*20 birds (Slaterus *et al.* 2009). Trapping and netting worked only initially as the crows easily learned to avoid the nets, while trapping was made difficult due to opposition by local inhabitants. The birds are being shot one by one (A. den Hartog pers. comm.). This underlines the necessity of engaging with all stakeholders prior to the operation, to work carefully and to use both active and passive methods.

Passive methods (e.g. toxic baiting) ideally would be used initially to target the population, as these do not impact the efficacy of other methods, which create wariness but could be used later in a campaign (e.g. shooting).

Successful eradications have proven to be difficult, long and costly operations (Suleiman & Taleb 2010) if the crow population is large (Yap & Sodhi 2003, Suleiman *et al.* 2011). Therefore it is advisable to eradicate this population while it is still small.

## Conclusion

Madagascar has very few alien bird species, especially compared to other islands in the Malagasy region. Common Myna is the only true invasive alien bird species in Madagascar. House Crow has the potential to have major negative impacts on people and Madagascar's biodiversity, which is why, on the basis of experience in other countries (Yap & Sodhi 2004, Suleiman *et al.* 2011), we recommend that the small population at Toamasina be eradicated as swiftly as possible, under the strict control of the Malagasy agency responsible for the environment.


## Acknowledgements

We thank Colin Ryall (Kingston University), Arie den Hartog (Duke Faunabeheer), Sharif Jbour (BirdLife Jordan), Vikash Tatayah (Mauritian Wildlife Foundation), François-Xavier Couzi (Société d'Études Ornithologiques de la Réunion) and Marc Salamolard (Parc National de la Réunion) for providing unpublished information, Dr Karl Campbell and Erin Hagen (Island Conservation) for comments on an earlier version of this note, and Claire Galvez Wagler for assistance in locating references and for revising an early draft. Ron Demey and Roger Safford made constructive comments on the submitted version.


## References


BirdLife International. 2014. Species factsheet: *Corvus splendens*. www.birdlife.org (accessed 14 March 2014).

Cheke, A. S. 2008. Seafaring behavior in House Crows *Corvus splendens* – a precursor to ship-assisted dispersal? *Phelsuma* 16: 65–68.

Cheke, A. S. & Hume, J. 2008. *The Lost Land of the Dodo. An Ecological History of Mauritius, Réunion and Rodrigues*. London, UK: T & A. D. Poyser.

Coates, P. S., Spencer, J. O. & Delehanty, D. J. 2007. Efficacy of CPTH-treated egg baits for removing ravens. *Human–Wildlife Conflicts* 1: 224–234.

Feare, C. J. & Mungroo, Y. 1990. The status and management of the house crow *Corvus splendens* (Vieillot) in Mauritius. *Biol. Conserv.* 51: 63–70.

GISD. 2010. Global Invasive Species database of the IUCN/ISSG (Invasive Species Specialist Group of the World Conservation Union). Factsheet on *Corvus splendens.* www.issg.org (accessed March 2014).

Island Conservation. 2012a. Threatened Island Biodiversity database. http://tib.islandconservation.org (accessed 13 March 2014).

Island Conservation. 2012b. Database of Island Invasive Species Eradications. http://eradicationsdb.fos.auckland.ac.nz (accessed 13 March 2014).

Langrand, O. 1990. *Birds of Madagascar.* New Haven & London, UK: Yale University Press.

Madge, S. C. 2009. House Crow *Corvus splendens.* In del Hoyo, J. Elliott, A. & Christie, D. A. (eds.) *Handbook of the Birds of the World.* Vol. 14. Barcelona: Lynx Edicions.

Mittermeier, R. A., Konstant, W. R., Goettsch Mittermeier, C., Mast, R. B. & Murdoch, J. D. 1999. Madagascar. In Mittermeier, R. A., Myers, N., Robles Gil, P. & Goettsch Mittermeier, C. (eds.) *Hotspots – Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions.* Mexico City: Cemex Press.

Mittermeier, R. A., Langrand, O., Lowry, P. P., Schatz, G., Gerlach, J., Goodman, S., Steininger, M., Hawkins, F., Raminosoa, N., Ramilijaona, O., Andriamaro, L., Randrianasolo, H., Rabarison, H. & Rakotobe, Z. L. 2004. Madagascar and the Indian Ocean islands. In Mittermeier, R. A., Robles Gil, P., Hoffmann, M., Pilgrim, J., Brooks, T., Goettsch Mittermeier C., Lamoreux J. & Fonseca, G. A. B. (eds.) *Hotspots Revisited – Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions.* Mexico City: Cemex Press.

Mwinyi, A. A. & Said, T. A. 2009. *Crows Eradication Programme. Survey on Population, Distribution and Socio-economic Impacts of Crows in Zanzibar, Tanzania.* Zanzibar: Marine and Coastal Environment Management Programme.

Nyari, A., Ryall, C. & Peterson, T. 2006. Global invasive potential of the house crow *Corvus splendens* based on ecological niche modeling. *J. Avian Biol.* 37: 306–311.

Ottens, G. & Ryall, C. 2003. House Crows in the Netherlands and Europe. *Dutch Birding* 25: 312–319.

Peh, K. S. H. & Sodhi, N. S. 2002. Characteristics of nocturnal roosts of house crows in Singapore. *J. Wildl. Manage.* 66: 1128–1133.

Pranty, W. 2004. Florida's exotic avifauna: a preliminary checklist. *Birding* 36: 362–372.

Ryall, C. 1992. Predation and harassment of native bird species by the Indian house crow *Corvus splendens* in Mombasa, Kenya. *Scopus* 16: 1–8.

Ryall, C. 2003. Notes on the ecology and behaviour of House Crows at Hoek van Holland. *Dutch Birding* 25: 167–172.

Ryall, C. 2010. Further records and updates of range extension in House Crow *Corvus splendens. Bull. Br. Ornithol. Cl.* 114: 90–100.

Safford, R. J. 2013. House Crow *Corvus splendens.* In Safford, R. J. & Hawkins A. F. A. (eds.) *The Birds of Africa.* Vol. 8. London, UK: Christopher Helm.

Sinclair, I. & Langrand, O. 2013. *Birds of the Indian Ocean Islands.* Cape Town: Struik.

Skerrett, A. & Bullock, I. 2001. *Birds of the Seychelles.* Princeton, NJ: Princeton University Press.

Slaterus, R., Aarts, B. & van den Bremer, L. 2009. *De Huiskraai in Nederland: Risicoanalyse en Beheer.* SOVON onderzoeksrapport 2009/8. Beek-Ubbergen: SOVON Vogelonderzoek Nederland.

Société d'Etudes Ornithologiques de la Réunion (SEOR). 2010–11. *Fiche de Reconnaissance. Le Corbeau familier : Corvus splendens.* La Réunion: SEOR.

Suleiman, A. S. & Taleb, N. 2007. Eradication of House Crow *Corvus splendens* on Socotra, Yemen. *Sandgrouse* 32: 136–140.

Suleiman, A. S., Meier, G. G. & Haverson, P. J. 2011. Eradication of the house crow from Socotra Island, Yemen. In Veitch, C. R., Clout, M. N. & Towns, D. R. (eds.) *Island Invasives: Eradication and Management.* Gland: IUCN.

Yap, C. A. M. & Sodhi, N. S. 2004. Southeast Asian invasive birds: ecology, impact and management. *Orn. Sci.* 3: 57–67.

[a] *Haarweg 217, 6709 RM Wageningen, Netherlands. E-mail: theolinders@gmail.com*

[b] *Island Conservation, 2161 Delaware Avenue, Suite A, Santa Cruz, CA 95060 USA. E-mail: Olivier.langrand@islandconservation.org*

Received 1 May 2014; revision accepted 15 May 2014.